

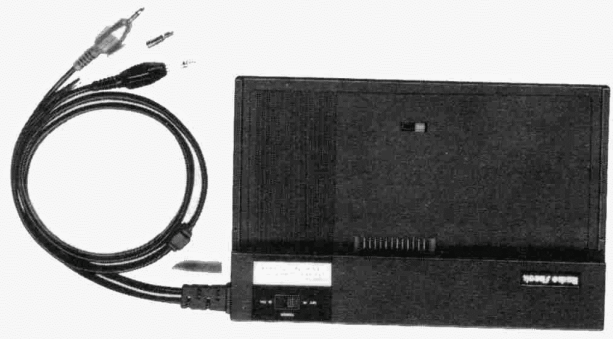
26-3650/3651/3653

Radio Shack® Service Manual

TRS-80®

PC-4 Pocket Computer and Cassette Interface

Catalog Number: **26-3650**
26-3651
26-3653



CUSTOM MANUFACTURED FOR RADIO SHACK, A DIVISION OF TANDY CORPORATION

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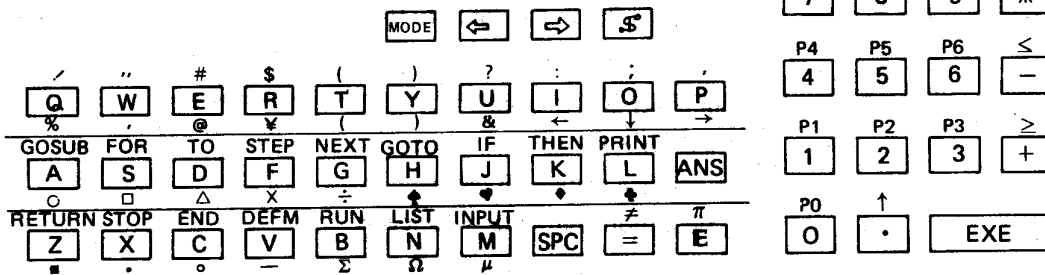
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1. SPECIFICATIONS

Keyboard layout



Display

Display tube: AC-61255

Display method: 5 x 7 dot matrix liquid crystal

Display capacity: 11 columns (alphanumeric characters and symbols)

Fundamental calculation functions:

Negative numbers, exponentials, parenthetical addition, subtraction, multiplication and division (with priority sequence judgement function (true algebraic logic)

Built-in functions:

Trigonometric/inverse trigonometric functions (angular units-degree/radian/gradient), logarithmic/exponential functions, square root, powers, conversion to integer, deletion of integer portion, absolute value, symbolization, designation of number of effective positions, designation of number of decimal positions, random numbers, π

Commands:

INPUT, PRINT, GOTO, FOR-NEXT, IF-THEN, GOSUB, RETURN, STOP, END, RUN, LIST, LIST A, MODE, SET, VAC, CLEAR, CLEAR A, DEFM, SAVE, SAVE A, LOAD, LOAD A, PUT, GET, VER

Program functions:

KEY, CSR, LEN, MID, VAL

Calculation range:

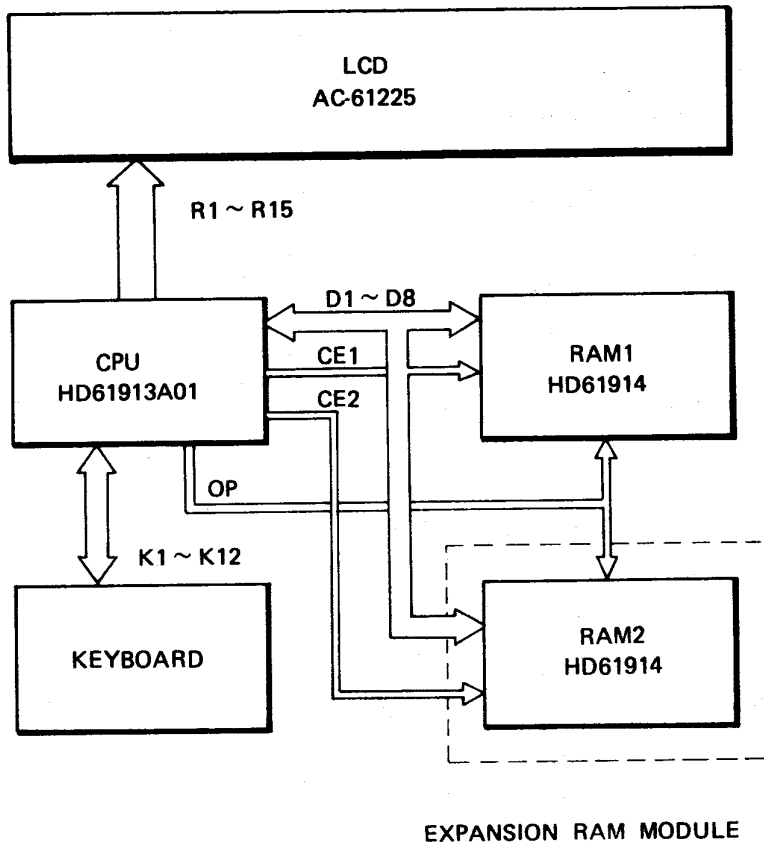
$\pm 1 \times 10^{-99}$ to $\pm 9.999999999 \times 10^{99}$ and 0
(internal calculation uses 12 mantissa positions)

Program system:

Stored system

Program language:	BASIC
Number of steps:	Maximum 544 steps (maximum 1,568 steps when optional RAM pack is loaded)
Program capacity:	Maximum 10 programs (P0 through P9)
Number of memories:	Standard 26, expandable to 94 (maximum 222 memories when optional RAM pack is loaded) and exclusive character variable (\$)
Number of stacks:	Subroutine – 8 levels FOR-NEXT loop – 4 levels Numerical value – 6 levels Calculation elements – 12 levels
Power supply:	Two lithium batteries (CR2032)
Power consumption:	Maximum 0.02W
Battery life:	Main frame only – approximately 360 hours (continuous use)
Auto power-off:	Power is turned off automatically approximately 7 minutes after last operation.
Dimensions:	9.8mmH × 165mmW × 71mmD (3/8" H × 6-1/2" W × 2-3/4" D)
Weight:	116g (4.1 oz) including batteries

2. BLOCK DIAGRAM



LCD: 12-digit dot-matrix display. A character or a number is displayed in 5 × 7 dots.

CPU: CMOS VLSI one-chip microprocessor unit.

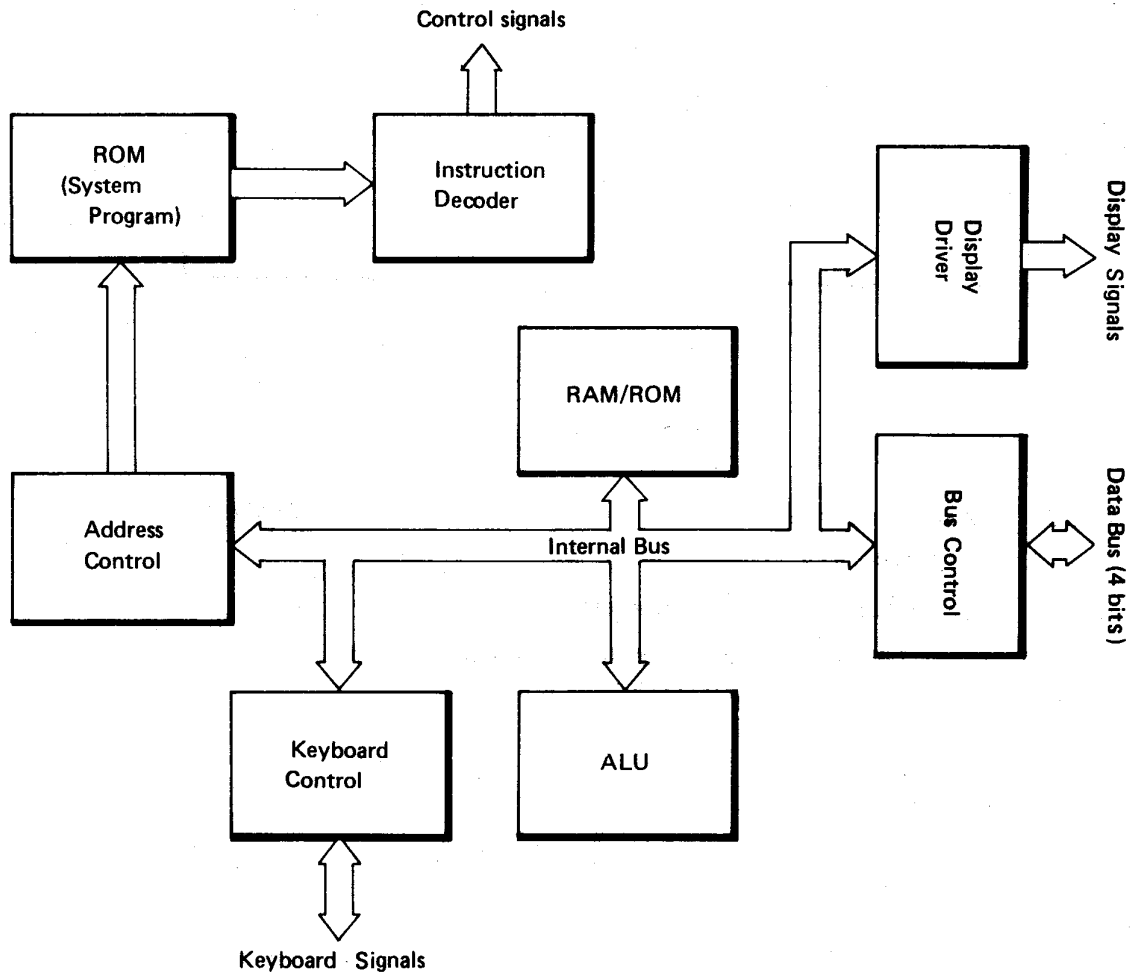
RAM: Stores data and program. Each RAM has 1K bytes (8K bits) capacity and contains self-control circuit.

3. CPU (Central Processing Unit) HD61913

3-1. Features

- CMOS one-chip CPU
- Built-in ROM: 100864 bits
- Built-in RAM: 1896 bits
- Built-in display driver
- Memory backup function
- Clock: 400 kHz
Internal machine cycle: 200 kHz
Minimum instruction execute time: 10 μ S

3-2. CPU Block Diagram



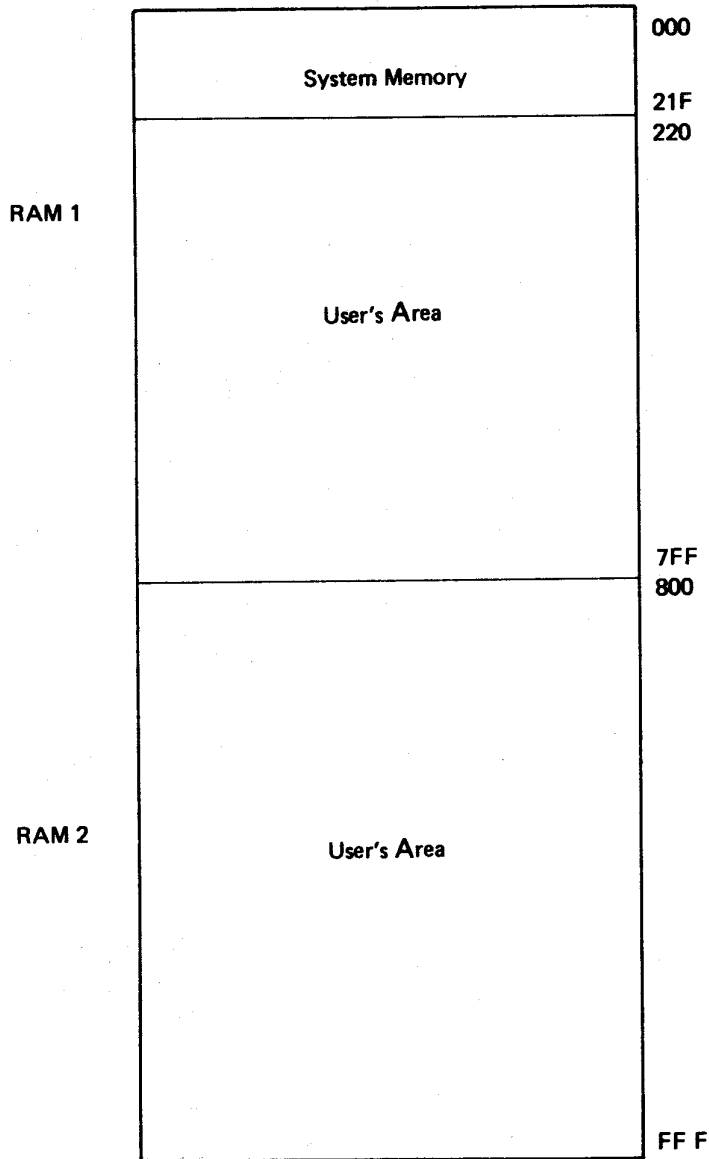
3-3. CPU Signal Descriptions

Pin No.	Signal Name	In/Out	Function
1 ~ 4	D1 ~ D8	In/Out	Data bus. Also designates RAM address while signal OP is HIGH.
5	INT		Not used.
6 ~ 18	K12 ~ K1	In/Out	Key input/output signals.
19	SW	In	Power switch input signal.
20 ~ 24	V5 ~ V1	In	LCD drive voltages. These voltages are generated by connecting external resistors to VDD2.
25, 26	OSO, OSI	In/Out	By connecting 56 kohm external resistance between these terminals, clock pulse is internally generated.
27 ~ 72	R15 ~ R7	Out	LCD display signals.
73	GND	In	0 (zero) volt power source.
74, 75	CE1, CE2	Out	Chip enable signals. CE1 selects RAM 1 at HIGH level while CE2 designates RAM 2 at HIGH level.
76	VDD1	In	-5.5V input.
77	VDD2	Out	-5.5V output from the LSI. Stays -5.5V at power ON. Goes to 0V at power-off) or APO (Auto Power-Off).
78, 79	$\phi 1, \phi 2$	Out	Clock pulses.
80	OP	Out	When the signal is HIGH, the data bus becomes address bus for RAMs and also becomes the command code for the optional cassette tape interface.

4. RAM (Random Access Memory)

HD61914 is 1K byte RAM and contains self-control circuits.

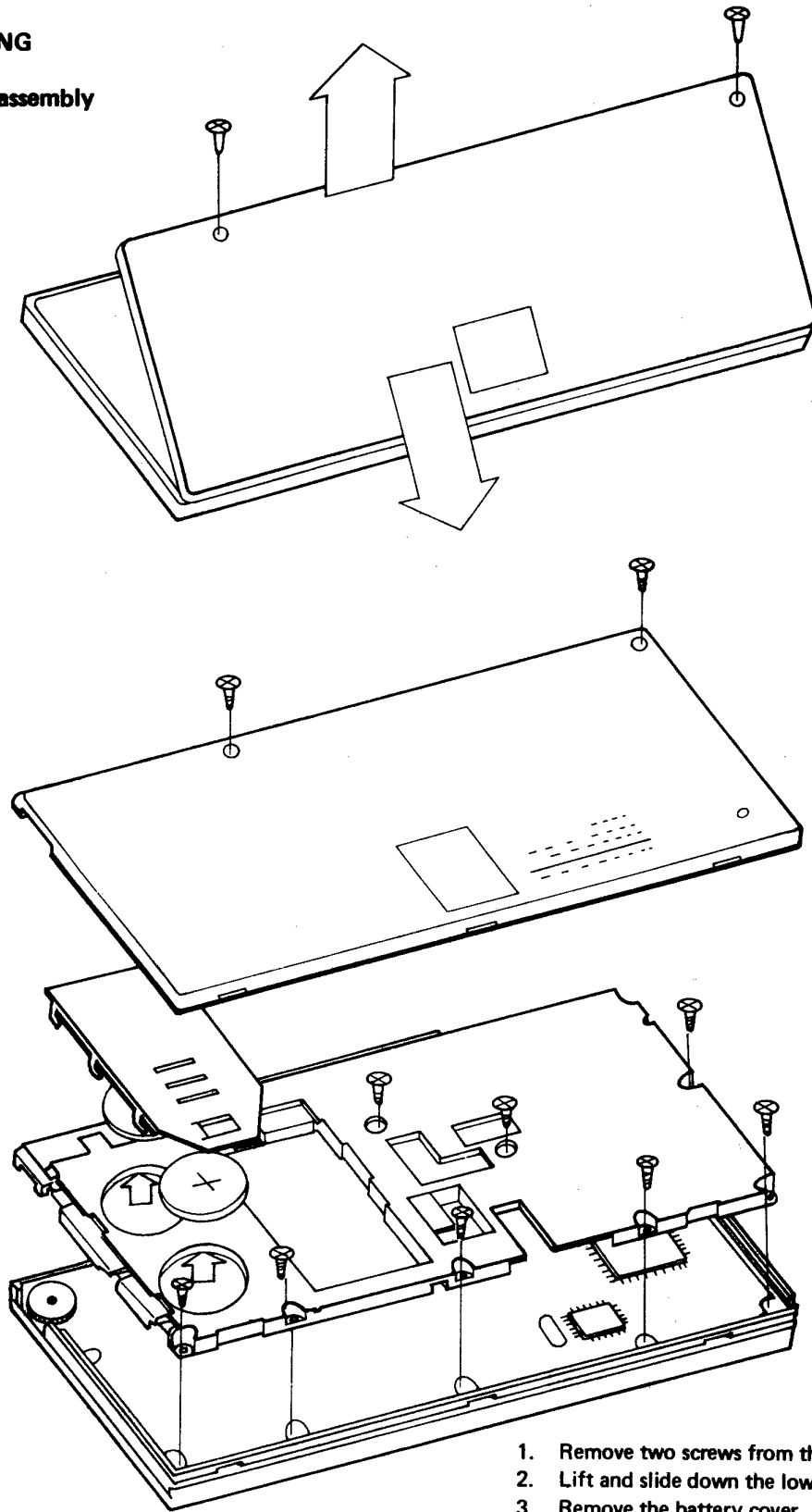
The following shows a memory map of RAM 1 and RAM 2 (optional RAM pack).



Note: The above addresses are for cases when one word is 4 bits.

5. SERVICING

5-1. Disassembly





1. Remove two screws from the back.
2. Lift and slide down the lower case.
3. Remove the battery cover.
4. Extract batteries.
5. Remove eight screws from the guide plate.
6. Remove the guide plate.

5-2. Trouble shooting

Note: Numbers in CAUSE column denote order of possibility.

A. Display

LSI's to function: CPU, RAM 1

OPERATION	TROUBLE	CAUSE
Turn the power switch on. Push the ALL RESET button on the back of the computer.	 <p>Dot display cannot be shown.</p>	<ol style="list-style-type: none"> 1. RAM 1 2. CPU
	No display at all or unusual indication.	CPU
	 <p>Some dots cannot be displayed.</p>	<ol style="list-style-type: none"> 1. CPU 2. LCD 3. Heat seal

B. Key Entry

LSI's to function:

CPU Key input operation, Displaying.

RAM 1 Storing entered numbers or characters.

TROUBLE	CAUSE
No entry at all.	<ol style="list-style-type: none"> 1. CPU 2. Wiring between CPU and keyboard.
Cursor moves, but entered number or character cannot be displayed.	<ol style="list-style-type: none"> 1. RAM 1 2. CPU 3. Wiring between CPU and RAM 1.
Only characters can be entered	<ol style="list-style-type: none"> 1. CPU 2. Wiring between CPU and keyboard.

C. RAM 1

- (1) Remove optional RAM module if equipped.
- (2) Push the ALL RESET button on the bottom.
- (3) Operate DEFM 62 **EXE**.
- (4) Write the following program.

```
10 FOR I = 1 TO 87
20 A (I) = I
30 PRINT A (I)
40 NEXT I
50 PRINT "RAM OK"
60 END
```

- (5) After writing the above program, confirm that the remaining program step is 0.
- (6) Execute the program and confirm the display counts up from 1 to 87 and shows RAM OK by every depression of the **EXE** key.

If the above operations cannot be made, RAM 1 may be faulty.

D. RAM2 (Optional RAM module)

- (1) Install the RAM module in a PC-4.
- (2) Push the ALL RESET button on the bottom.
- (3) Operate **MODE** 1 and confirm that the remaining program step is 1568.

If the display shows the remaining step as 544

- (a) RAM2 is not functioning.
- (b) Wiring between CPU and RAM2 has failed.

- (4) Operate DEFM 190 **EXE** and confirm the display ***VAR:216.
- (5) Write the following program.

```
10 FOR I = 1 TO 215
20 A (I) = I
30 PRINT A (I)
40 NEXT I
50 PRINT "MODULE OK"
```

- (6) Execute the program and confirm the display counts up from 1 to 215 and shows MODULE OK by every depression of **EXE** key.

If the above program is not performed, the RAM2 (optional RAM module) may be at fault.

E. Discrimination Between CPU and RAM 1

If a test unit passes the preceding checking procedures and a problem still exists, follow the calculations.

(1) Manual Calculations Below

Perform the following calculations manually.

$$1 + 2 * (3 + 4 * (5 + 6 * (7 + 8)))$$

Correct answer 767.

(In DEG mode)

$$(\text{TAN} (\text{COS} (\text{SIN} (\text{LOG} 100)))) \text{ [EXE]}$$

Correct answer 0.0174550616

If the above calculations cannot be made, the CPU may be faulty.

(2) Program

Execute the following program after pushing the ALL RESET button on the bottom.

```
10 FOR I = 1 TO 2 : FOR J = 1 TO 2 : FOR K = 1 TO 2 :  
  FOR L = 1 TO 2  
20 NEXT L : NEXT K : NEXT J : NEXT I  
30 GOSUB 40 : PRINT "END" : END  
40 GOSUB 50 : RETURN  
50 GOSUB 60 : RETURN  
60 GOSUB 70 : RETURN  
70 GOSUB 80 : RETURN  
80 GOSUB 90 : RETURN  
90 GOSUB 100 : RETURN  
100 GOSUB 110 : RETURN  
110 RETURN
```

After execution of this program,
display should show END.

If the above manual calculations (1) are done but the program (2) cannot be executed, RAM1 may be faulty.

5-3. Test Program

Program No.	Line No.	Program
P0	10	VAC
	20	FOR I = 1 TO 2 : FOR J = 2 TO 3 : FOR K = 3 TO 4 : FOR L = 6 TO 4 STEP -1
	30	NEXT L : NEXT K : NEXT J : NEXT I
	40	GOSUB 50 : PRINT "TEST 1 OK" : END
	50	GOSUB 60 : RETURN
	60	GOSUB 70 : RETURN
	70	GOSUB 80 : RETURN
	80	GOSUB 90 : RETURN
	90	GOSUB #1 : RETURN
P1	10	IF "AB" = "AB" THEN 20
	15	GOTO 1
	20	IF "A" < "AB" THEN 30
	25	GOTO 1
	30	IF "AB" > "A" THEN 40
	35	GOTO 1
	40	IF "12" ≤ "AB" : IF "AB" ≥ "12" THEN 50
	45	GOTO 1
	50	IF -123 ≠ 123 : IF 123 < -123 THEN 1
	60	IF -1234 > -123 THEN 1
	70	IF -123 ≤ -1234 THEN 1
	80	IF 123 ≥ 456 THEN 1
	90	IF 456 = 123 THEN 1
100	GOSUB #2 : RETURN	
P2 Note 1	10	IF RND (SIN 195 + COS 234 + TAN 1E-3 + EXP 1 + LOG 163, -5) ≠ 4.0839 THEN 1
	20	C = C + 12345 X 12345 / 234 / 345 + SQR 0 + SQR 2 + SQR -30 + --- SIN 30 + 2
	30	FOR H = -5 TO 4 : D = D + RND (5544.4455, H) : NEXT H
	40	A = 1 : E = A (A (A (A (A (A)))))
	50	GOSUB #3
	60	RETURN
P3 Note 2	10	X = 123 : O\$ = "H&J" : \$ = O\$ + "="
	20	\$ = MID (1, 3) + MID (4) + "ABC"
	30	GOTO #4
P4	10	IF I + J + K + L ≠ 15 THEN 1
	20	IF A + B + E + X = 125 THEN 30
	25	GOTO ER
	30	IF \$ ≠ "H&J = ABC" THEN 1
	40	IF RND (C, -5) ≠ 1894.4034 THEN 1
	50	IF RND (D, 2) ≠ 55000 THEN 1
	60	GOTO #5
P5	10	GOTO 20
	15	RETURN
	20	GOTO 15
P9	10	FOR A = 1 TO 201 : A (A) = A + 9999999000 : NEXT A
	20	\$ = "ABCDEFGHJKLMNOPQRSTUVWXYZx+/-"
	30	FOR A = 1 TO 201 : IF A (A) ≠ 9999999000 + A THEN ER
	40	NEXT A : IF \$ ≠ "ABCDEFGHJKLMNOPQRSTUVWXYZx+/-" THEN ER
	50	PRINT "TEST OK!"

- Notes:
- P2 line 10 cannot be fully entered if you use a one-key command (e.g. **SHIFT** **J** for IF). Therefore, enter the program manually without spaces.
 - P3 line 10; "&" can be entered by . . .
 - MODE** (EXT mode set)
 - press the **SHIFT** (the red S) key
 - Press the "U" key
 - MODE** (EXT mode reset)

Testing Procedure

Save the test program on a cassette tape through a cassette tape interface unit by the operation SAVE A **EXE**.

- (1) Install a RAM module into the test unit (PC-4).
- (2) Push the ALL RESET button on the bottom of the test unit.
- (3) Connect the PC-4 to a cassette tape interface and a tape recorder which contains a test program cassette tape.
- (4) Load the test program from the cassette tape by the operation LOAD A **EXE**.
- (5) After loading the Program change the PC-4 to WRITE mode by the operation **MODE** 1 and confirm that the remaining program step is 789.
- (6) Operate **MODE** 0 (RUN mode selection).
- (7) Execute PO (Program number 0).
- (8) Confirm the display "TEST 1 OK".
- (9) Clear the programs PO to P5.

Example to clear P2 . . .

- (a) **SHIFT** 2 (P2 designation).
- (b) **MODE** 1 (WRITE mode selection).
- (c) CLEAR **EXE** (erasing P2).

Note: **SHIFT** is the red S button.

- (10) Change the PC-4 to RUN mode by **MODE** 0 **EXE**.
- (11) Operate DEFM 176 **EXE**.
- (12) Execute P9.

Confirm the display "TEST OK! "

6. PROGRAM COMMAND LIST

Classification	Command Name	Format	Function
Input statement	INPUT	INPUT variable string	Causes data to be entered from the keyboard during execution of a program. The program execution is stopped until after the end of input.
	KEY	Character variable = KEY	Reads a character entered during execution of a program and assigns it to a character variable. Since the program is not stopped by this command, nothing is assigned to the character variable if no key entry is made.
Output statement	PRINT	PRINT output control function { ; } output element { ; } ...	Outputs the designated output element.
	CSR	CSR n { ; } (0 ≤ n ≤ 11)	Displays from the designated nth position.
Branching	GOTO	GOTO { line no. variable }	Causes control to jump to the designated line number.
	IF ... { THEN } ...	IF comparison expression { THEN line no. ; command }	Causes control to jump to the line number following THEN, or executes the command following ";", if the result of the comparison is true. Causes control to proceed to the next line number if the result of the comparison is false.
	GOSUB	GOSUB { line no. variable }	Calls out the subroutine of the designated line number for execution. After the subroutine is executed, control returns to the GOSUB statement by the RETURN statement to proceed to the command following that statement.
	RETURN	RETURN	Signifies the end of a subroutine; returns control to the command/statement/function next to the GOSUB statement.
Looping	FOR	FOR v = e1 TO e2 [STEP e3] *v denotes a numerical variable, and e1, e2 and e3 represent a numerical expression respectively.	Declares the beginning of a loop in which numerical value v changes from initial value e1 to terminal value e2 in increments of e3. The loop is repeated $\frac{e2 - e1}{e3} + 1$ times between the FOR and NEXT statements. If the increment e3 is omitted, e3 is regarded as "1".
	NEXT	NEXT v	Signifies the end of a FOR loop. If the result of v plus e3 is equal to or smaller than e2, the loop is repeated again. If it is greater than e2, control proceeds to the line next to the NEXT statement.

Execution stop	STOP	STOP	Stops the execution of a program temporarily to bring the system into a key-in wait state. The execution can be continued by pressing the [EXE] key.
Execution end	END	END	Signifies the end of a program; the system returns to its pre-execution state. The execution of a program, once ended, cannot be continued even if the [EXE] key is pressed.
Data clearing	VAC	VAC	Clears all variable data for a program.
Program listing	LIST	LIST [line no.]	Displays a listing of all the statements in a program from the designated line number downward.
All program listing	LIST A	LIST A	Displays a listing of the statements in all programs.
Program execution	RUN	RUN [line no.]	Causes a program to start from the designated line number.
Program erasing	CLEAR	CLEAR	Clears the currently designated program area of a program.
	CLEAR A	CLEAR A	Clears all the programs.
Angular unit designation	MODE	MODE $\left\{ \begin{array}{l} 4 \\ 5 \\ 6 \end{array} \right\}$	Designates trigonometric angular units as degree (4), radian (5) or gradient (6).
Format designation	SET	SET $\left\{ \begin{array}{l} E_n \\ F_n \\ N \end{array} \right\}$ ($0 \leq n \leq 9$)	Designates the number of effective positions or number of decimal positions for the displayed numerical value.
Character function	LEN	LEN (character variable)	Calculates the size of the character variable.
	MID	MID (m [, n])	Extracts n characters from the mth character in the exclusive character variable (S).
	VAL	VAL (character variable)	Converts the numbers in a character variable to a numerical value.
Option use	SAVE	SAVE ["filename"]	Records only the program in the currently designated program area on tape.
	LOAD	LOAD ["filename"]	Calls out the program from the tape and loads it to the currently designated program area.
	SAVE A	SAVE A ["filename"]	Records the programs in all program areas on tape at the same time.
	LOAD A	LOAD A ["filename"]	Calls out all programs from the tape and loads them to the respective program areas.
	PUT	PUT ["filename"] variable	Records the data in the variable on tape.
	GET	GET ["filename"] variable	Calls out the data from the tape and loads it in the variable.
	VER	VER ["filename"]	Checks to confirm that the programs or data have been recorded on the tape properly.

7. ERROR MESSAGE LIST

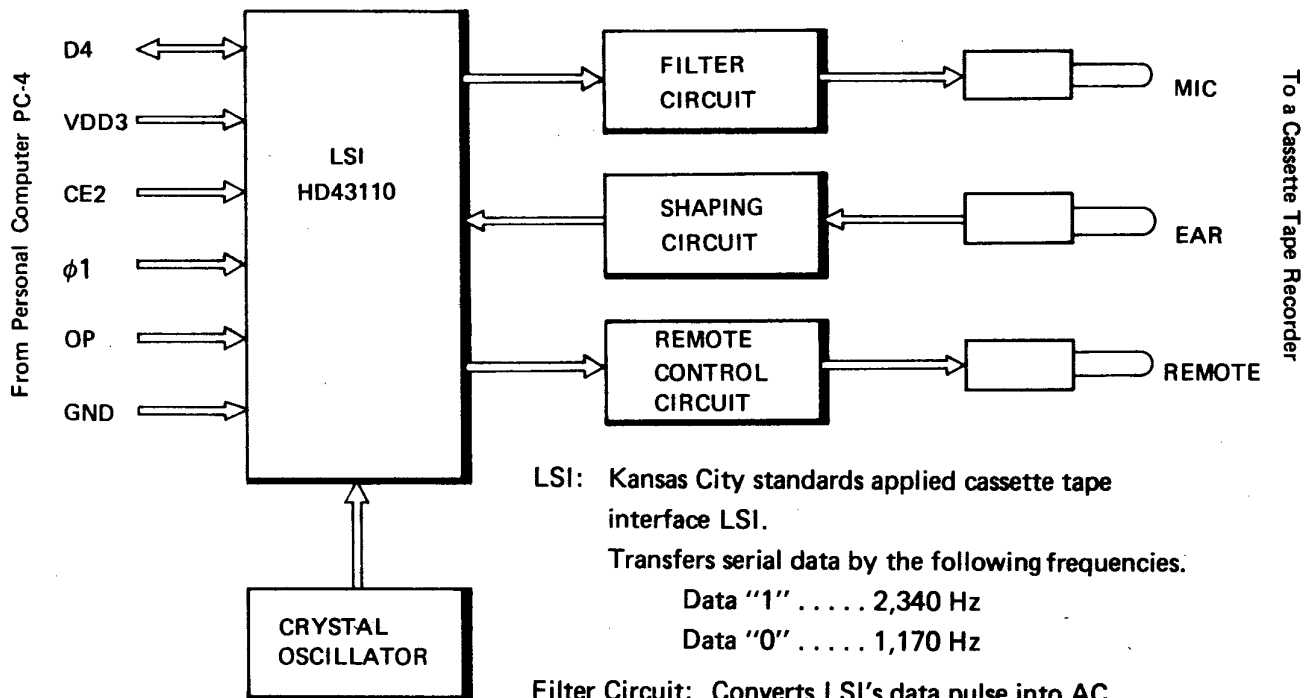
Error Code	Meaning	Cause	Corrective Measure
1	Memory overflow or system stack overflow	<ul style="list-style-type: none"> • Program cannot be written due to insufficient number of steps or memory cannot be expanded. • Stack overflow due to a complicated calculation formula. 	<ul style="list-style-type: none"> • Clear unnecessary programs or reduce the number of memories. • Divide and simplify the numerical expression.
2	Syntax error	<ul style="list-style-type: none"> • A mistake has been made in writing the program, etc. • The left side format is different from the right side format in a substitution statement, etc. 	<ul style="list-style-type: none"> • Correct the error in the input program, etc.
3	Mathematical error	<ul style="list-style-type: none"> • The calculation result of a numerical expression is 10^{100} or greater. • Outside the input range of a numerical function. • The result is indefinite or impossible. 	<ul style="list-style-type: none"> • Correct the calculation formula or data. • Verify the data.
4	Undefined line number error	<ul style="list-style-type: none"> • No designated line number for a GOTO statement or a GOSUB statement. 	<ul style="list-style-type: none"> • Correct the designated line number.
5	Argument error	<ul style="list-style-type: none"> • For a command or function that requires an argument, the argument is outside the input range. 	<ul style="list-style-type: none"> • Correct the argument error.
6	Variable error	<ul style="list-style-type: none"> • Attempt was made to use a memory which has not been expanded. • Attempt was made to use the same memory for a numerical variable and a character variable at the same time. 	<ul style="list-style-type: none"> • Expand the memory properly. • Do not use the same memory for a numerical variable and a character variable at the same time.
7	Nesting error	<ul style="list-style-type: none"> • A RETURN statement appears other than during subroutine execution. • A NEXT statement appears other than during a FOR loop or the variable of the NEXT statement is different from that of the FOR statement. • Subroutine nesting exceeds 8 levels. • FOR loop nesting exceeds 4 levels. 	<ul style="list-style-type: none"> • Remove the unnecessary RETURN statement or NEXT statement. • Reduce the subroutines or FOR-NEXT loops to within the maximum levels.
9	Option error	<ul style="list-style-type: none"> • Execution is performed in the PRT mode, or an option command such as SAVE is executed when no printer or tape recorder is connected. 	<ul style="list-style-type: none"> • Connect a printer or tape recorder. Release the PRT mode.

II. CASSETTE INTERFACE (26-3651)

1. SPECIFICATIONS

Output terminal:	White mini-plug, output impedance: approx. 40 kohms, output level: 3 ~ 50mV
Input terminal:	Black mini-plug, input impedance: approx. 20 kohms, input level: 2.5 ~ 50V.
Remote control terminal:	Gray sub mini-plug, 24V, 1A or less.
Data recording format:	Kansas City standards (300BPS).
Power source:	(For remote control) Two AA size dry batteries.
Power consumption:	0.3W.
Battery life (for continuous operation):	Approx. 7 hours.
Dimensions:	173mmW × 114mmD × 31.5mmH.

2. BLOCK DIAGRAM



LSI: Kansas City standards applied cassette tape interface LSI.

Transfers serial data by the following frequencies:

Data "1" 2,340 Hz

Data "0" 1,170 Hz

Filter Circuit: Converts LSI's data pulse into AC waveform for tape recorder.

Shaping Circuit: Converts AC waveform data from tape recorder into square pulse for the LSI.

3. LSI (HD43110)

HD43110 is a cassette tape interface LSI with Kansas City standards which transfers data between the CPU and cassette tape recorder.

Data "0" and "1" are transferred in serial as 1,170 Hz and 2,340 Hz frequency pulse respectively. Data is transferred at 300 bits per second.

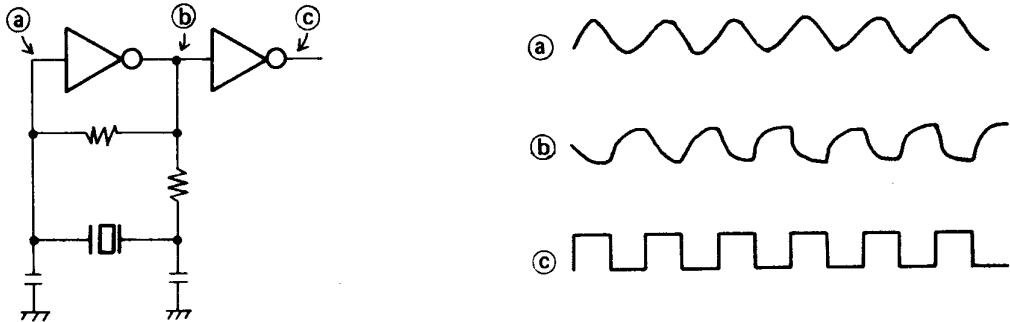
The following lists the functions of each terminal of the LSI.

Pin No.	Signal Name	In/Out	Function
2	OSC	In	Clock pulse (32,768Hz) input.
7	VDD'	Out	-3V output.
8	CONT	In	The LSI functions only when the terminal is HIGH.
9	VDD1	In	-3V input.
10	CE	In	Chip enable terminal. The LSI is designated from PC-4 when the terminal is HIGH.
11	SP	In	Strobe pulse input from PC-4.
13	D4	In/Out	Serial data input/output.
14	GND	In	0V input terminal.
17	C3	In	Data input from cassette tape.
18	C2	Out	Data output to cassette tape.
19	C1	Out	Remote control (auto stop) signal output.

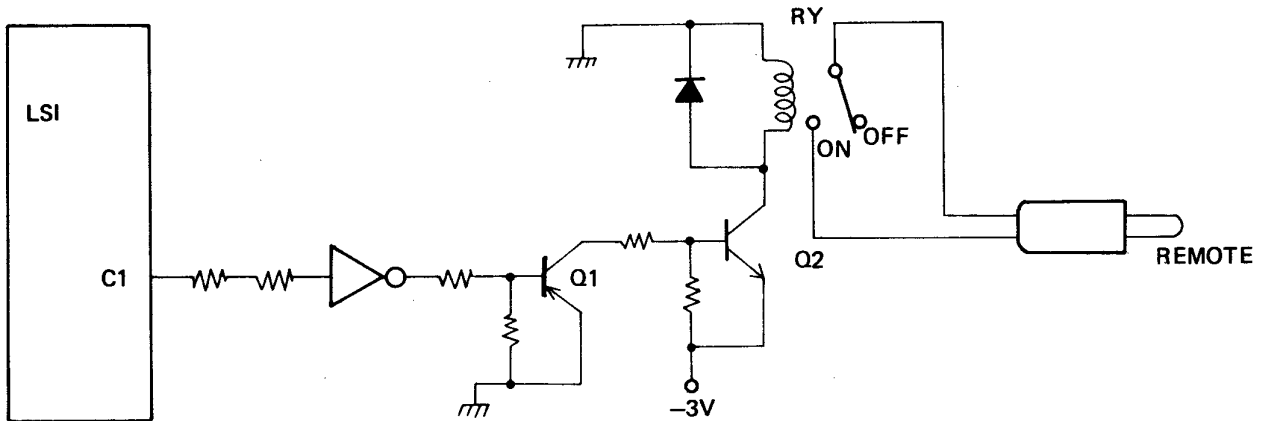
4. CIRCUMFERENCE CIRCUITS

4-1. Clock Pulse Generator

32,768Hz signal is generated by the crystal oscillator and is shaped by the inverters.

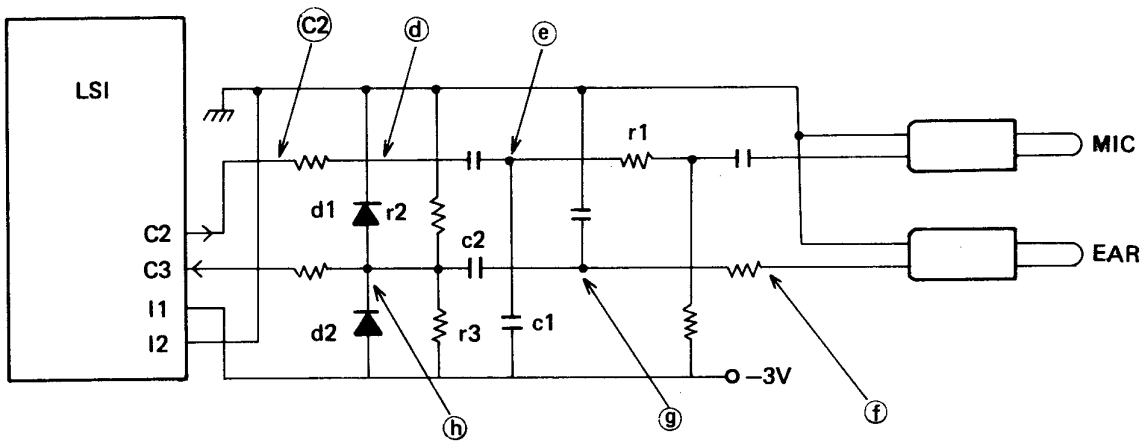


4-2. Remote Control Circuit

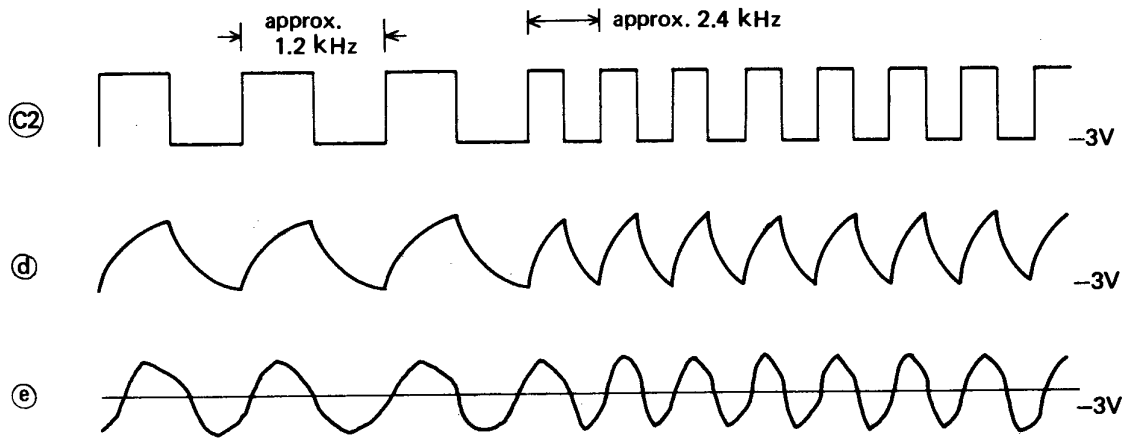


When signal C1 is HIGH, transistors Q1 and Q2 turn on causing relay RY to be switched on so that the REMOTE terminal becomes active.

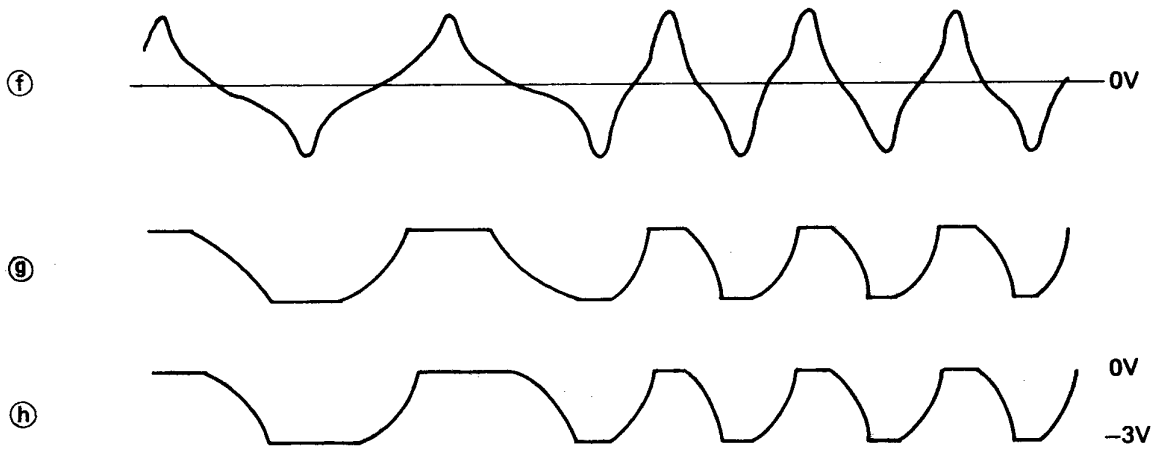
4-3. Shaping Circuit and Filter



Filter waveforms



Data output C2 from the LSI is integrated (waveform ④) and shaped into an AC waveform (waveform ⑤) by capacitor c1 and resistor r1.

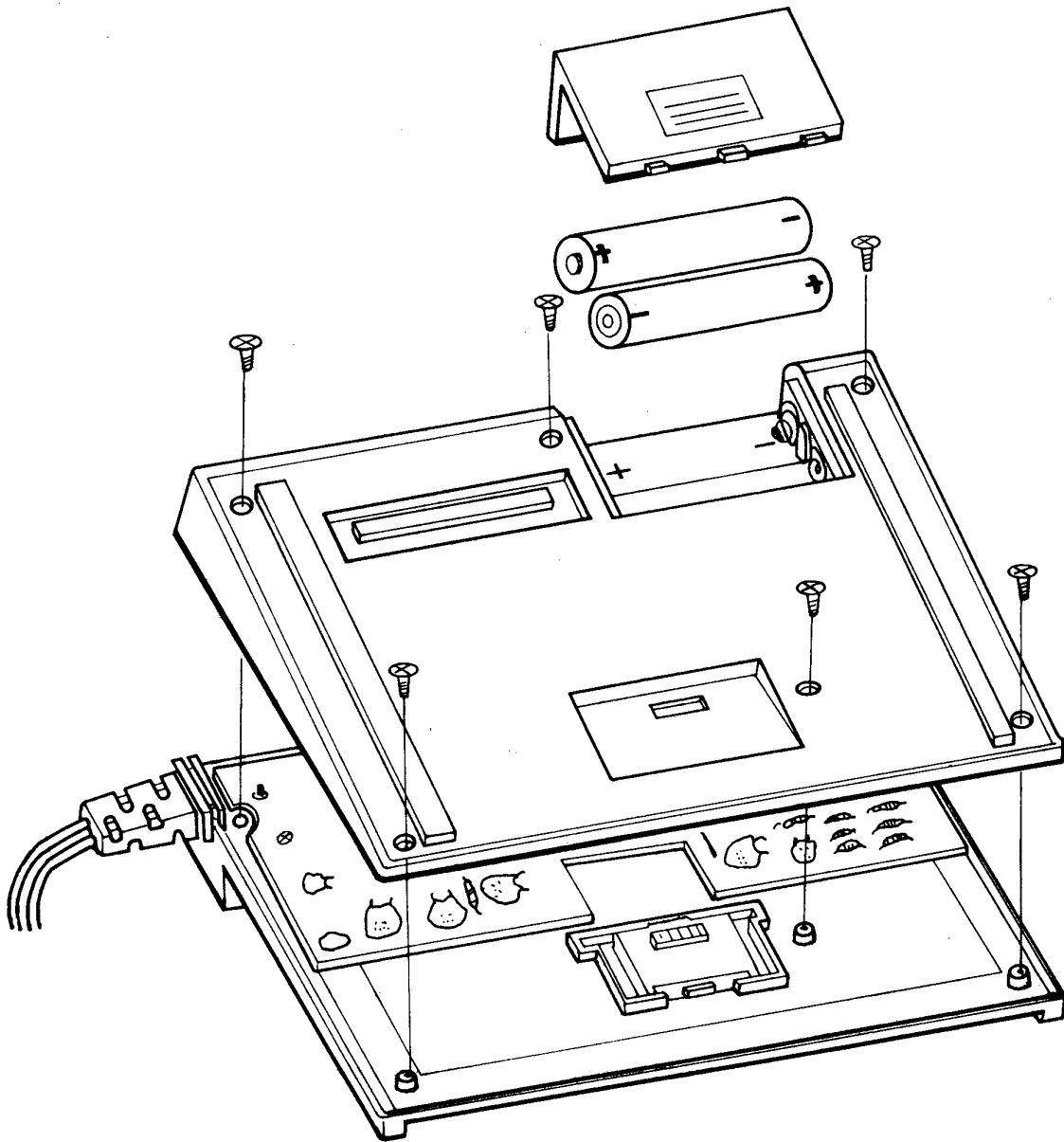


Input signal from tape recorder ⑥ is integrated by capacitor c2 and resistors r2 and r3 (waveform ⑦).

The waveform ⑦ is cramped between -3V and 0V by diodes d1 and d2.

5. SERVICING

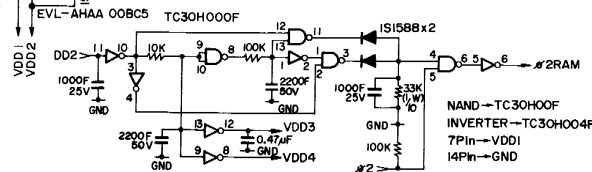
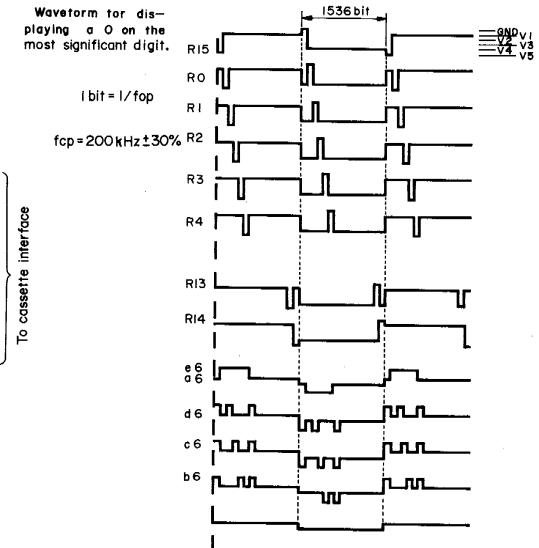
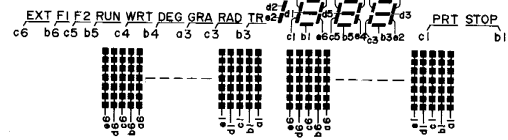
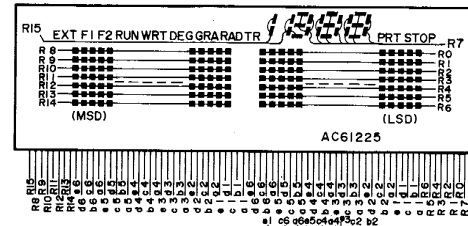
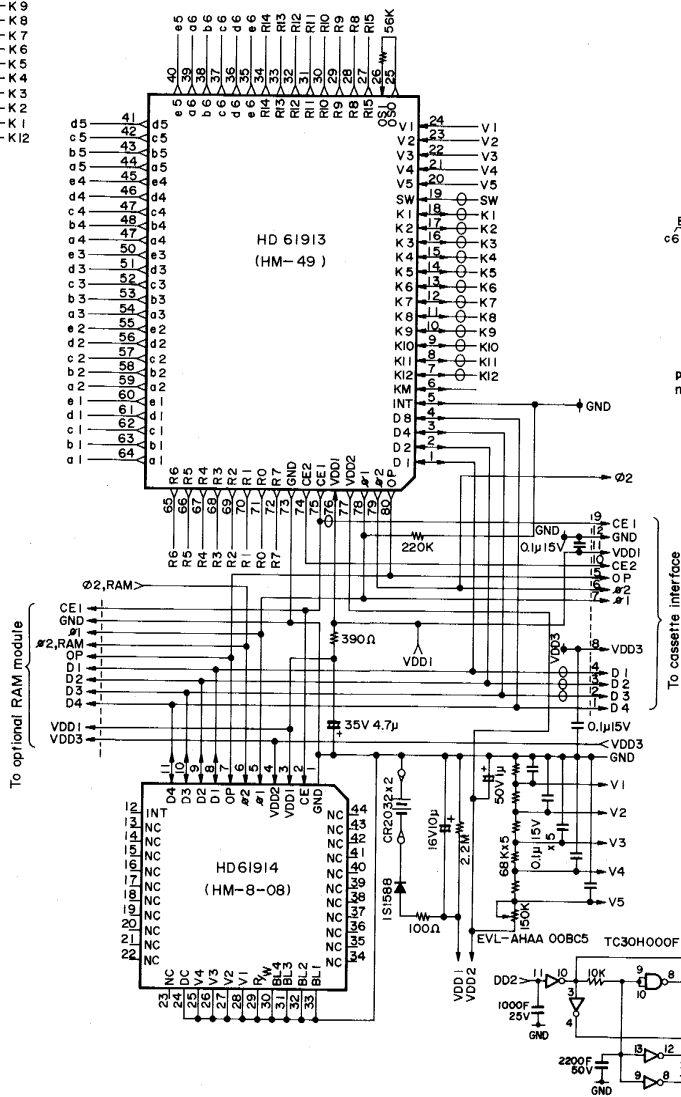
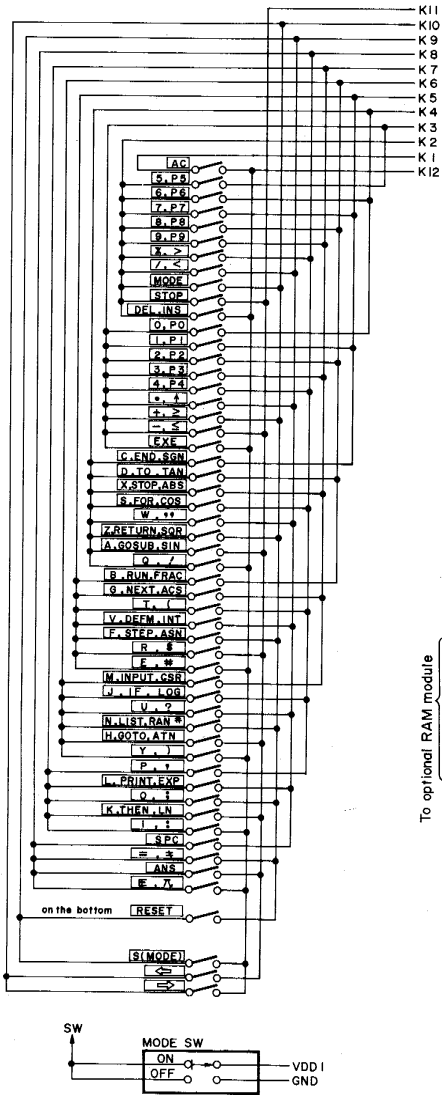
5-1. Disassembly



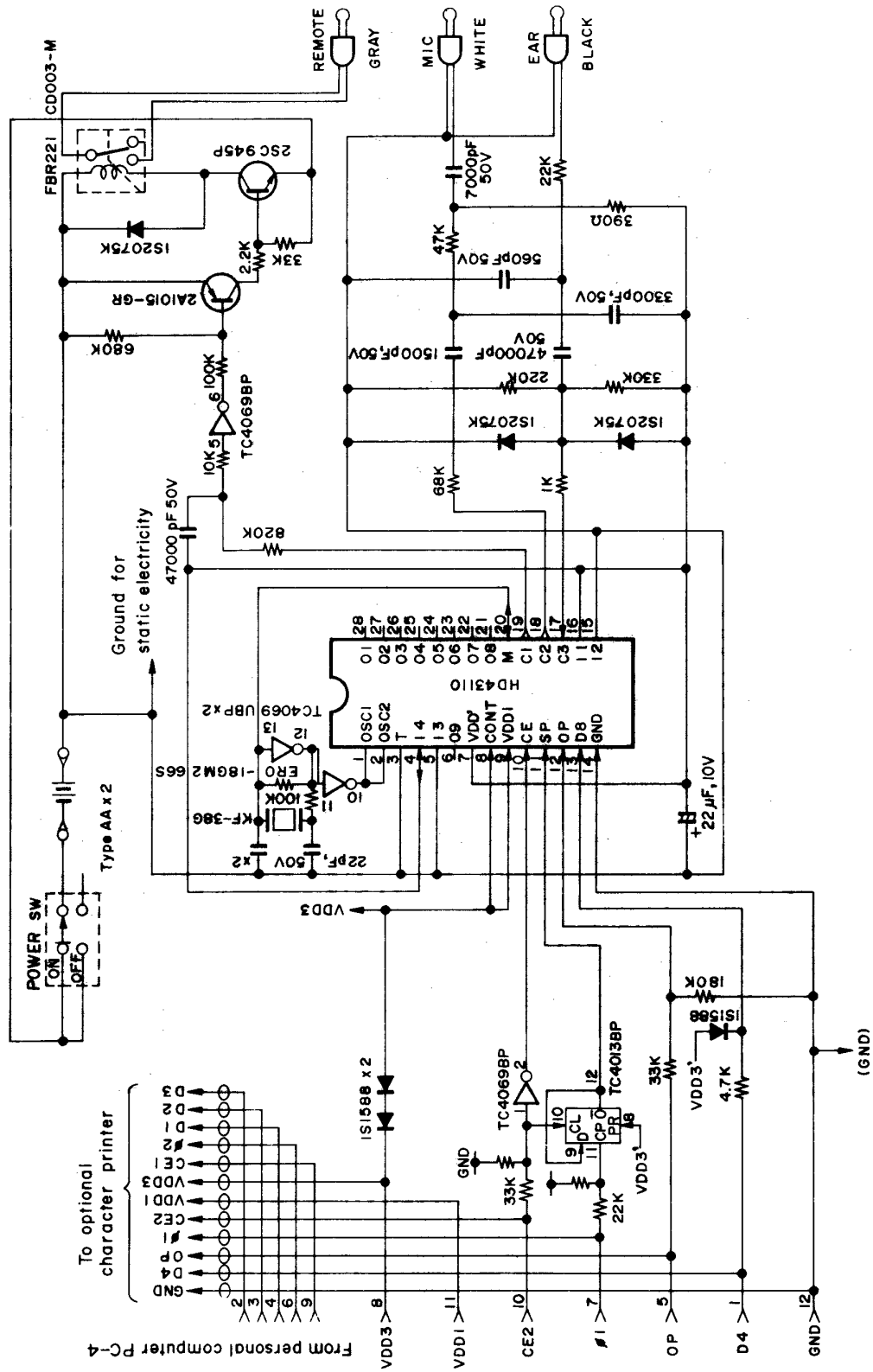
1. Remove six screws from the back.
2. Open the lower case.

5-2. Troubleshooting

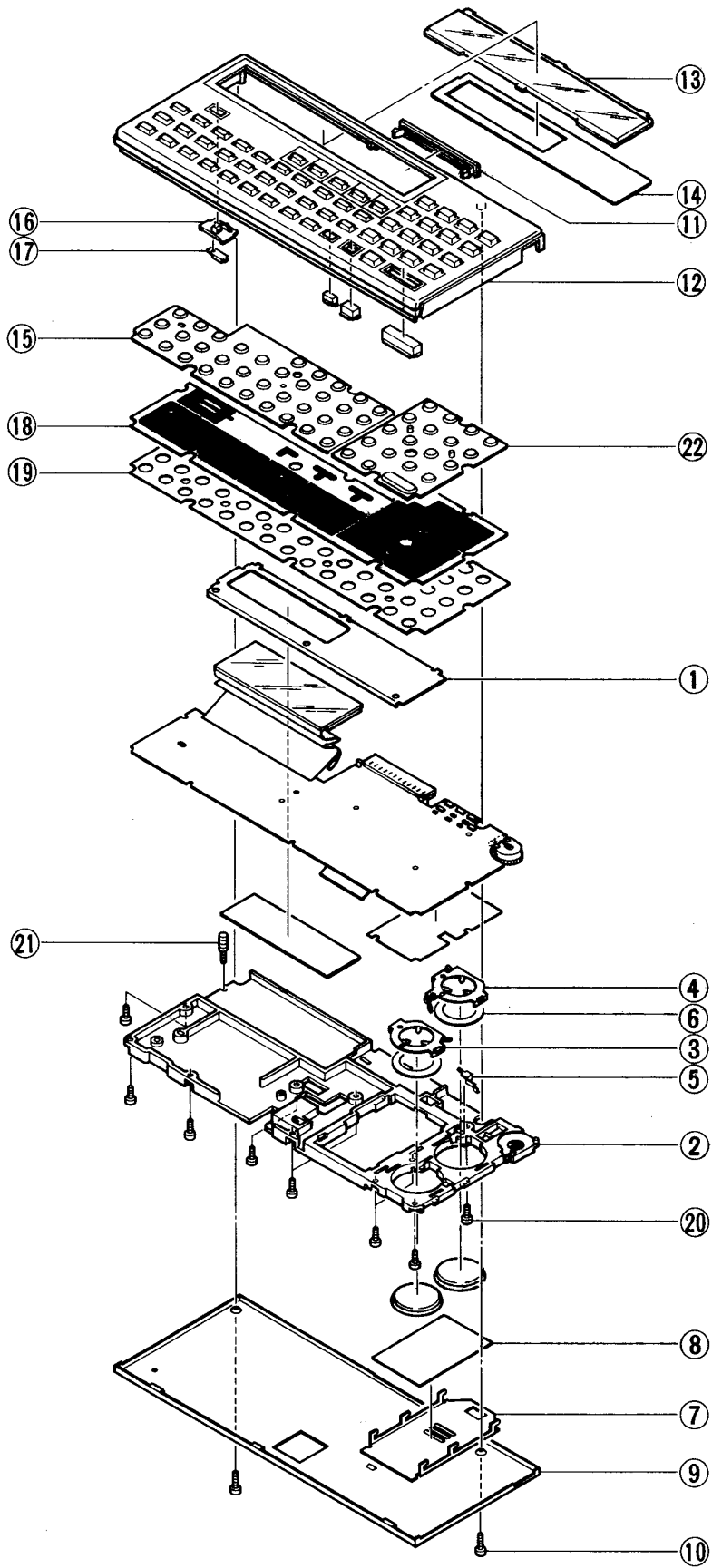
TROUBLE	CHECK POINT	SOLUTION
SAVE impossible	Open circuit of jack cable.	Replace jack cable.
	Check the LSI terminal signals.	If signals are normal, replace the LSI.
	Head of the cassette tape.	Clean the head.
LOAD impossible	Output level of tape recorder.	Turn the volume control to max.
	Check to see if there is an open circuit in jack cable.	Replace jack cable.
	Does the tape recorder function properly?	Test the cassette recorder with a tape of music.
	Clock pulse.	Replace crystal oscillator.
	Signal C3 of the LSI.	Shaping circuit. If C3 is normal, replace the LSI.
Remote control impossible	Click sound of the relay at saving or loading.	If click cannot be heard, check signal C1 of the LSI. If signal C1 is not output from the LSI, replace the LSI. If C1 is normal, remote control circuit may be faulty.
	Check to see if there is no open circuit in jack cable.	Replace jack cable.
	Clock pulse.	Crystal oscillator.
No function at all	Is PC-4 properly connected?	Connect correctly.
	Poor contact of connector.	Replace connector.
	Clock pulse.	Crystal oscillator.



2. 26-3651



Exploded View
26-3650



VI. PARTS LIST

1. 26-3650

Ref.	Description	RS Location	Manufacturer Part Number
	LSI, HD61913 (CPU)		20013583
	LSI, HD61914 (RAM)		20013516
	MOS IC, TC40H000F		21003956
	MOS IC, TC40H004F		21003964
	Diode, 1S1588		23003031
	Rotary volume EVL-AHAA00BC5 (150Kohm)		27709150
	Resistor, Chip ERJ-8GCSJ391 (390ohm, ±5%, 1/8W)		27909051
	Resistor, Chip RC315B10K-J (10Kohm, ±5%, 1/8W)		27908195
	Resistor, Chip RC315B220K-J (200Kohm, ±5%, 1/8W)		27908071
	Resistor, Chip RC315B65K-G (68Kohm, ±2%, 1/8W)		27908551
	Resistor, Chip ERJ-8GCSJ225 (2,200Kohm, ±5%, 1/8W)		27909485
	Capacitor, Chip CM21YV103P15V (0.1 μ F, 15V, ±20%)		71032167
	Capacitor, Chip C3225C0G1H222K (2,200pF, 50V, +10%)		28907407
	Capacitor, Chip CM21CH102K25V (1,000pF, 25V, +10%)		28907415
	Resistor, Chip ERJ-8GCSK101 (1Kohm, 1/8W, ±5%)		27909019
	Resistor, Carbon Film ERD10TJ333 (33Kohm, 1/10W, +5%)		26116473
	Battery, Rithium, CR-2032TRBULK		38001329
	Resistor, Chip ERJ-8GCSJ563 (56Kohm, 1/8W, +5%)		27909400
	Capacitor, Electrolytic SRA35VB-4R7 (4.7 μ F, 35V, +10%)		28014082

Ref.	Description	RS Location	Manufacturer Part Number
	Capacitor, Electrolytic SRA16VB-10 (10 μ F, 16V, +10%)		28014040
	LCD, LD-B8105A		33306768
	Connector 126D-019-12S04		35113639
	Seal, TH heat TH-07-1		56004397
1	Plate, Reinforcement G420 A35393-1		63327140
	Tape, LCD Adhesive G110B A44636-1		63275120
	Plate, Heat Seal Insulation A-G420 A45916A-1		
	Plate, Heat Seal Insulation B-G420 A45916A-2		63327161
	Spring, P G195 A33138A-1		63248131
2	Holder, PCB A1820D-2		63345174
3	Spring, Battery A-G272 A33938A-1		63297621
4	Spring, Battery B-G272 A33939-1		63297630
5	Spring, Battery C-G272 A33940-1		63297640
6	Plate, Battery Insulation G272 A45154-1		63297660
	Cushion Battery G1002 A46287-1		63336860
7	Holder, Battery G420 A45884-1		63327190
8	Plate, Insulation B-G420 A45918-2		63339490
	Plate, Insulation A-G420, A45921A-1		63327171
	Plate, Insulation E-G420A A46326-2		63339970
	Plate, Insulation F-G420 A46327-1		63339980
9	Panel, Lower G1002R A35387A-3 (Canada, USA)		63344171
	Panel, Lower G1002T, A35387-5 (UK, Belgium, Australia)		63351940
10	Screw for Case B-G420 A45919-1		63326880
11	Cap, Connector G420 A45915-1		63326900

Ref.	Description	RS Location	Manufacturer Part Number
12	Case Sub Ass'y, Upper A35384C-3		63344183
13	Window G420 A35388-1		63326920
14	Frame, Display G1002 A45881-4		63344190
15	Key Contact, Rubber A-G420 A35389-1		63326970
16	Knob, Slide G420 A35391-1		63326980
17	Spring, Switch Contact G310 A45208-1		63298310
	Spacer, Switch G420 A46325-1		63339930
18	Film, Common G420 A21302-1		63327290
19	Spacer G1002 A46286-1		63336870
20	Screw, Flat C-G321 A33793-3		63282790
21	Spring, Ground, G1002R A46432-1		63345160
22	Rubber, Key Contact B-G420 A35390-1		63327030
	Key Top Set for PC-4 (GX-1002AA)		00018003
	Case, Soft G1002RA, A35692-1 (Canada, USA)		63344241
	Case, Soft G1002TA, A35895-1		63352170
	P.C.B. Assembly G1002RA		60900010

2. 26-3651

Ref.	Description	RS Location	Manufacturer Part Number
	LSI, HD43110, Interface Drive		20009951
	IC, TC4013BP, Flip-Flop, MOS		21003310
	IC, TC4059BP, Inverter, MOS		21003862
	Transistor, 2SA1015-Y, Remote PNP		22003534
	Transistor, 2SC1815-Y, Remote NPN		22800016
	Capacitor, Ceramic, 22pF 50V, $\pm 10\%$ HE405JSL220K		28186191
	Capacitor, Ceramic, 560pF, 50V, $\pm 10\%$ HE408JYB561K		28180098
	Capacitor, Ceramic, 1500pF, 50V, $\pm 10\%$ HE405JYB152K		28180136
	Capacitor, Ceramic, 3300pF, 50V, $\pm 10\%$ HE705JYB332K		28180152
	Capacitor, Semiconductor Ceramic, 0.047 F, 50V, $\pm 20\%$, SC45F1H473Z		28127511
	Resistor, Solid, 26Mohm, 1/8W, $\pm 20\%$, ERC-18GM2665		27901476
	Relay, FBR211CD003-M		31206057
	Capacitor, Electrolytic 22 F, 10V, $\pm 10\%$		28040954
	Diode, Silicon, 1S2075K21		23001021
	Resistor, Carbon Film, 390ohm, 1/4W, $\pm 5\%$, R-25-390-J		26003911
	Resistor, Carbon Film, 2.2Kohm, 1/4W, $\pm 5\%$, R-25-2.2K-J		26005710
	Resistor, Carbon Film, 1Kohm, 1/4W, $\pm 5\%$, R-25-1K-J		26004918
	Resistor, Carbon Film, 10Kohm, 1/4W, $\pm 5\%$, R-25-10K-J		26007313
	Resistor, Carbon Film, 22Kohm, 1/4W, $\pm 5\%$, R-25-22-K-J		26008115
	Resistor, Carbon Film, 33Kohm, 1/4W, $\pm 5\%$, R-25-33K-J		26008514
	Resistor, Carbon Film, 47Kohm, 1/4W, $\pm 5\%$, R-25-47K-J		26008913

Ref.	Description	RS Location	Manufacturer Part Number
	Resistor, Carbon Film, 68Kohm, 1/4W, ±5%, R-25-68K-J		26009316
	Resistor, Carbon Film, 180Kohm, 1/4W, ±5%, R-25-180K-J		26010314
	Resistor, Carbon Film, 220Kohm, 1/4W, ±5%, R-25-220K-J		26010519
	Resistor, Carbon Film, 330Kohm, 1/4W, ±5%, R-25-330-K-J		26010918
	Resistor, Carbon Film, 680Kohm, 1/4W, ±5%, R-25-680K-J		26011710
	Resistor, Carbon Film, 820Kohm, 1/4W, ±5% R-25-820K-J		26016118
	Crystal, Oscillator, 32,768HZ, KF-38G		71100138
	Resistor, Carbon Film, 4.7Kohm, 1/4W, ±5%, R-25-4.7K-J		26006511
	Resistor, Carbon Film, 100Kohm, 1/4W, ±5%, R-25-100K-J		26009715
	Resistor, Carbon Film, 120Kohm, 1/4W, ±5%		26009910
	[Case Sub Ass'y, Upper A35413C-2]		63344334
	Plate, LOGO A36263-2		63344360
	Plate, Power ON/OFF, Model Name, A45867-2		63344350
	Sheet, Insulation, Aluminum		63345140
	Case, Upper G426 A1803B-1		63329912
	[Case Sub Ass'y, Lower A21315B-2]		63344343
	Case, Lower, G426R, A1804A-2		63347241
	Plate, Rating, G426R, A46351-1 (USA, Canada)		63347250
	Plate, Rating, G426T, A46489-3 (UK, Belgium, Australia)		63351840
	Foot, Rubber, G426, A45990-1		63329990
	Plate, Ground, For Printer		63347260
	Spring, Battery Contact (-) G67 A43656-1		60006091

Ref.	Description	RS Location	Manufacturer Part Number
	Contact Battery (+), A-G55 A42606A-1		63452238
	Spring, Battery Contact (+/-) C-G164 A43733-1		63249297
	Bolt, HEX, 6.5 X 8mm Printer Fixing		63329900
	Nut, Hex, 10mm (Outside) X 5mm (Inside) X 3.6mm (T)		54015020
	Washer 11.2mm (Outside) X 6.5mm (Inside) X 0.8mm (T)		53012735
	Sheet, Insulation, Alminum For Lower Case		63345090
	Plate, Ground, For Computer		63345100
	Connector, 12Pin, Female 126D-019-12N04		35113639
	Connector, 12Pin, Male 126D-019-12P22		35103244
	Cord, Connection For Cassette PLGW-1596-01A		27009237
	Cover, Battery G426 A21328-1		63329890
	Knob, Slide, Lock-Free B-G426 A35453-1		63329950
	Knob, Slide, Power ON-OFF G426 A35452-1		63329940
	Capacitor, For Connector G426R A45915-1		63346370
	Plate, Computer Unit LOCK-FREE G426 A45988-1		63329960
	Plate, Slide, LOCK-FREE Knob A45987-1		63329970
	Spring, Switch Contact A4532C-1		62747023
	Screw, Tapping, Flate Head, M2 X 4 (Yellow) A-G321 A44793-1		63282780
	Screw, Tapping, Flat Head, M2 X 7 (Yellow) A-G426		63345110
	Spring, Earth A46432-1		63345160

Ref.	Description	RS Location	Manufacturer Part Number
	Screw, Tapping, Flat Head, M2 X 3 (Yellow) A-G320 A44793-11		63291680
	Screw, Tapping, Flat Head, M2 X 4 (Black) A-G324 A33953-3		63316670
	Screw, Tapping, Flat Head, M2 X 6 (Black), C-G302 A44793-9		63291620
	Case, Soft, G426RA, A35688B-1 (USA, Canada)		63344412
	Case, Soft, G426TA, A35897-1 (UK, Belgium, Australia)		63352220
	Cap, For Connector G426 A46150-1		63332410